

4 comprising:

5 holding means (211) for holding the surface

6 plasmon resonance sensor chip;

7 sample introducing means (282) for assigning a

8 plurality of different samples to said plural flow

9 channels (280), respectively, and for introducing each

10 of the plural samples into the respective flow channel

11 (280) in a state where the surface plasmon resonance

12 sensor chip is held by said holding means (211);

13 light irradiating means (212) for irradiating the

14 sensor surface with light from a predetermined

15 direction in a state where each sample is introduced

16 into the respective flow channel (282) by said sample

17 introducing means (282);

18 light receiving means (213) for receiving the

19 light reflected from the sensor surface;

20 measuring means (213) for measuring the intensity

21 of the light reflected by each said diffraction

22 grating surface (251-254) and received by said light

23 receiving means (213);

24 analyzing means for identifying, for each said

25 flow channel (280), a groove pitch at which a

26 resonance phenomenon of the evanescent wave and the

27 surface plasmon wave occurs, based on the intensity,

28 measured by said measuring means (213), of the

29 reflected light due to each said diffraction grating

30 surface (251-254), and for quantitatively and/or
31 qualitatively analyzing each sample flowing through
32 the respective flow channel (280), based on the groove
33 pitch identified for each said flow channel (280).

1 62. An apparatus for quantitatively and/or
2 qualitatively analyzing a sample using a surface
3 plasmon resonance sensor chip as defined in claim 44,
4 comprising:

5 holding means (211) for holding the surface
6 plasmon resonance sensor chip;
7 sample introducing means (282) for assigning a
8 plurality of different samples to said plural flow
9 channels (280), respectively, and for introducing each
10 sample into the respective flow channel (280) in a
11 state where the surface plasmon resonance sensor chip
12 is held by said holding means (211);

13 light irradiating means (212) for irradiating the
14 sensor surface with light from a predetermined
15 direction in a state where each sample is introduced
16 into the respective flow channel (280) by said sample
17 introducing means (282);

18 light receiving means (213) for receiving the
19 light reflected from the sensor surface;

20 measuring means (213) for measuring the intensity
21 of the light reflected by each said diffraction

22 grating surface (251-254) and received by said light
23 receiving means (213);

24 analyzing means for identifying, for each said
25 flow channel (280) and for each of the reaction area
26 and the non-reaction area, a groove pitch at which a
27 resonance phenomenon of the evanescent wave and the
28 surface plasmon wave occurs, based on the intensity,
29 measured by said measuring means (213), of the
30 reflected light due to each said diffraction grating
31 surface (251-254), and for quantitatively and/or
32 qualitatively analyzing each sample flowing through
33 the respective flow channel (280), based on the groove
34 pitches of the reaction area and the non-reaction area
35 identified for each said flow channel (280).

1 63. An apparatus for quantitatively and/or
2 qualitatively analyzing a sample using a surface
3 plasmon resonance sensor chip as defined in claim 39
4 or 40, comprising:

5 holding means (211) for holding the surface
6 plasmon resonance sensor chip with the sensor surface
7 (201a) being in contact with the sample;

8 light irradiating means (212) for irradiating the
9 sensor surface with light from a predetermined
10 direction in a state where the surface plasmon
11 resonance sensor chip is held by said holding means

12 (211);
13 light receiving means (213) for receiving the
14 light reflected from the sensor surface;
15 measuring means (213) for measuring the intensity
16 of the light reflected by each said diffraction
17 grating surface (251-254) and received by said light
18 receiving means (213);
19 determining means (214) for determining the
20 variation between the intensity, measured by said
21 measuring means (213), of the reflected light due to
22 each said diffraction grating surface (251-254) and
23 the intensity of the light reflected when any sample
24 is not in contact with the sensor surface (201a); and
25 analyzing means (214) for selecting a diffraction
26 grating surface (251-254) whose variation, determined
27 by said determining means (214), of the reflected-
28 light intensity is within a predetermined allowable
29 range for determination, and for quantitatively and/or
30 qualitatively analyzing the sample based on the
31 variation of the reflected-light intensity of the
32 selected diffraction grating surface (251-254).

1 64. An apparatus for quantitatively and/or
2 qualitatively analyzing a sample using a surface
3 plasmon resonance sensor chip as defined in claim 41,
4 comprising:

5 holding means (211) for holding the surface
6 plasmon resonance sensor chip with the sensor surface
7 being in contact with the sample;

8 light irradiating means (212) for irradiating the
9 sensor surface with light from a predetermined
10 direction in a state where the surface plasmon
11 resonance sensor chip is held by said holding means
12 (211);

13 light receiving means (213) for receiving the
14 light reflected from the sensor surface;

15 measuring means (213) for measuring the intensity
16 of the light reflected by each said diffraction
17 grating surface (251-254) and received by said light
18 receiving means (213);

19 correcting means (214) for correcting the
20 intensity of the reflected light due to each said
21 diffraction grating surface (251-254) with
22 consideration given to the intensity of the reflected
23 light due to the respective non-diffraction surface
24 (251x-254x);

25 determining means (214) for determining the
26 variation between the intensity, corrected by said
27 correcting means (214), of the reflected light due to
28 each said diffraction grating surface (251-254) and
29 the intensity of the light reflected when any sample
30 is not in contact with the sensor surface;

31 analyzing means (214) for selecting a diffraction
32 grating surface (251-254) whose variation, determined
33 by said determining means (214), of the reflected-
34 light intensity is within a predetermined allowable
35 range for determination, and for quantitatively and/or
36 qualitatively analyzing the sample based on the
37 variation of the reflected-light intensity of the
38 selected diffraction grating surface (251-254).

1 65. An apparatus for quantitatively and/or
2 qualitatively analyzing a sample using a surface
3 plasmon resonance sensor chip as defined in claim 42,
4 comprising:

5 holding means (211) for holding the surface
6 plasmon resonance sensor chip with the sensor surface
7 being in contact with the sample;

8 light irradiating means (212) for irradiating the
9 sensor surface with light from a predetermined
10 direction in a state where the surface plasmon
11 resonance sensor chip is held by said holding means
12 (211);

13 light receiving means (213) for receiving the
14 light reflected from the sensor surface;

15 measuring means (213) for measuring the intensity
16 of the light reflected by each said diffraction
17 grating surface (251-254) and received by said light

18 receiving means (213);
19 determining means (214) for determining, for each
20 of the reaction area and the non-reaction area, the
21 variation between the intensity, measured by said
22 measuring means (213), of the reflected light due to
23 each said diffraction grating surface (251-254) and
24 the intensity of the light reflected when any sample
25 is not in contact with the sensor surface; and
26 analyzing means (214) for selecting, for each of
27 the reaction area and the non-reaction area, a
28 diffraction grating surface (251-254) whose determined
29 variation of the reflected-light intensity is within a
30 predetermined allowable range for determination, and
31 for quantitatively and/or qualitatively analyzing the
32 sample based on the variation of the reflected-light
33 intensity of the selected reaction area and the
34 variation of the reflected-light intensity of the
35 selected non-reaction area.

1 66. An apparatus for quantitatively and/or
2 qualitatively analyzing a sample using a surface
3 plasmon resonance sensor chip as defined in claim 43,
4 comprising:
5 holding means (211) for holding the surface
6 plasmon resonance sensor chip;
7 sample introducing means (282) for assigning a

8 plurality of different samples to said plural flow
9 channels (280), respectively, and for introducing each
10 of the plural samples into the respective flow channel
11 (280) in a state where the surface plasmon resonance
12 sensor chip is held by said holding means (211);

13 light irradiating means (212) for irradiating the
14 sensor surface with light from a predetermined
15 direction in a state where each sample is introduced
16 into the respective flow channel (280) by said sample
17 introducing means (282);

18 light receiving means (213) for receiving the
19 light reflected from the sensor surface;

20 measuring means (213) for measuring the intensity
21 of the light reflected by each said diffraction
22 grating surface (251-254) and received by said light
23 receiving means (213);

24 determining means (214) for determining the
25 variation between the intensity, measured by said
26 measuring means (213), of the reflected light due to
27 each said diffraction grating surface (251-254) and
28 the intensity of the light reflected when any sample
29 does not flow through each said flow channel (280);

30 and

31 analyzing means for selecting, for each said flow
32 channel (280), a diffraction grating surface (251-254)
33 whose variation, determined by said determining means

34 (214), of the reflected-light intensity is within a
35 predetermined allowable range for determination, and
36 for quantitatively and/or qualitatively analyzing each
37 sample flowing through the respective flow channel
38 (280) based on the variation of the reflected-light
39 intensity of the diffraction grating surface (251-254)
40 selected for each said flow channel (280).

1 67. An apparatus for quantitatively and/or
2 qualitatively analyzing a sample using a surface
3 plasmon resonance sensor chip as defined in claim 44,
4 comprising:

5 holding means (211) for holding the surface
6 plasmon resonance sensor chip;
7 sample introducing means (282) for assigning a
8 plurality of different samples to said plural flow
9 channels (280), respectively, and for introducing each
10 of the plural samples into the respective flow channel
11 (280) in a state where the surface plasmon resonance
12 sensor chip is held by said holding means (211);

13 light irradiating means (212) for irradiating the
14 sensor surface with light from a predetermined
15 direction in a state where each sample is introduced
16 into the respective flow channel (280) by said sample
17 introducing means (282);

18 light receiving means (213) for receiving the

19 light reflected from the sensor surface;
20 measuring means (213) for measuring the intensity
21 of the light reflected by each said diffraction
22 grating surface (251-254) and received by said light
23 receiving means (213);
24 determining means (214) for determining, for each
25 of the reaction area and the non-reaction area, the
26 variation between the intensity, measured by said
27 measuring means (213), of the reflected light due to
28 each said diffraction grating surface (251-254) and
29 the intensity of the light reflected when any sample
30 does not flow through each said flow channel (213);
31 and
32 analyzing means (214) for selecting, for each
33 said flow channel (280) and for each of the reaction
34 area and the non-reaction area, a diffraction grating
35 surface (251-254) whose variation, determined by said
36 determining means (214), of the reflected-light
37 intensity is within a predetermined allowable range
38 for determination, and for quantitatively and/or
39 qualitatively analyzing each sample flowing through
40 the respective flow channel (280), based on the
41 variation of the reflected-light intensity of the
42 selected reaction area and the variation of the
43 reflected-light intensity of the selected non-reaction
44 area for each said flow channel (280).

1 68. An apparatus as defined in one of claims 58-
2 67, wherein it further comprises sample separating
3 means (292) for separating the sample by physical
4 and/or chemical action prior to introducing the sample
5 to the surface plasmon resonance sensor chip.

1 69. An apparatus as defined in claim 68, wherein
2 said sample separating means (292) is operable to
3 separate the sample by a separation technique using at
4 least one of liquid chromatography, HPLC (high
5 performance liquid chromatography), capillary
6 electrophoresis, microchip electrophoresis, flow
7 injection, and microchannel.

1 70. An apparatus as defined in one of claims 58-
2 69, wherein
3 the target species is a light-emitting substance,
4 said light receiving means (213) is operable to
5 detect the light emitted from the light-emitting
6 substance that is bound to the binding substance, and
7 said analyzing means (214) is operable to
8 quantitatively and/or qualitatively analyze the sample
9 with consideration given to the detection result of
10 the light emission by said light receiving means
11 (213).

1 71. A surface plasmon resonance sensor chip
2 comprising:

3 a metal layer (23) along whose surface a surface
4 plasmon wave can be induced by light irradiation; and
5 a diffraction grating curved surface (25)
6 disposed in the vicinity of said metal layer (23),
7 said diffraction grating curved surface (25) having a
8 diffraction grating with a uniform groove orientation
9 and a uniform groove pitch so as to generate an
10 evanescent wave upon light irradiation;

11 wherein said diffraction grating curved surface
12 (25) has a curved surface form in a convex shape whose
13 light-irradiated side bulges out, and is disposed so
14 as to be perpendicular to a specific plane (S1), which
15 is perpendicular to a predetermined reference plane
16 (S0), and the diffraction grating is formed in such a
17 manner that the groove orientation is perpendicular to
18 the specific plane (S1).

1 72. A surface plasmon resonance sensor chip
2 comprising:

3 a metal layer (233) and a diffraction grating
4 (235) formed in the vicinity of a sensor surface,
5 which comes in contact with a sample; and
6 a resonance area (238a-238d), formed on the

7 sensor surface (231a), for causing a resonance
8 phenomenon of a surface plasmon wave, which is induced
9 along the surface of said metal layer (233), and an
10 evanescent wave, which is generated by the action of
11 the diffraction grating, upon light irradiation;
12 wherein said resonance area (238a-238d) has a
13 plurality of continuous areas (238a-238d) discretely
14 formed on the sensor surface (231a), and at least one
15 continuous area (238a-238d) among the plural
16 continuous areas (238a-238d) has a diffraction grating
17 whose at least one of the groove pitch and the groove
18 orientation is different from those of the remaining
19 continuous areas (238a-238d).

1 73. A surface plasmon resonance sensor chip
2 comprising:
3 a metal layer (233) and a diffraction grating
4 (235) formed in the vicinity of a sensor surface,
5 which comes in contact with a sample; and
6 a resonance area , formed on the sensor surface,
7 for causing a resonance phenomenon of a surface
8 plasmon wave, which is induced along the surface of
9 said metal layer (233), and an evanescent wave, which
10 is generated by the action of the diffraction grating,
11 upon light irradiation;
12 wherein said resonance area is formed

13 continuously on the sensor surface, and the groove
14 orientations of the diffraction grating (225) are
15 uniform while the groove pitches of the diffraction
16 grating (225) have a continuous or discontinuous
17 distribution.